



4.3 Radiological Surveillance of Hanford Site Drinking Water

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The quality of drinking water at the Hanford Site is monitored by routinely collecting and analyzing drinking water samples and comparing the resulting analytical data with established drinking water standards and guidelines (WAC 246-290; 40 CFR 141; EPA-570/9-76-003; EPA 822-R-96-001; DOE Order 5400.5; see Appendix D, Tables D.2 and D.5). In 2000, radiological surveillance of drinking water supplied to Hanford Site facilities by DOE-owned pumps and water treatment facilities was conducted by Pacific Northwest National Laboratory for DynCorp Tri-Cities Services, Inc. DynCorp Tri-Cities Services, Inc. conducted routine chemical and microbiological monitoring of these drinking water systems.

The national primary drinking water regulations of the *Safe Drinking Water Act* apply to the drinking water supplies at the Hanford Site. In Washington State, these regulations are enforced by the Washington State Department of Health. Washington Administrative Code (WAC 246-290) requires that all drinking water analytical results be reported routinely to the Washington State Department of Health. In recent years, radiological results for the Hanford Site have been reported to the state through this annual environmental report and through an annual supplemental data compilation (PNNL-13487, APP. 1). Non-radiological data have been reported to the state by DynCorp Tri-Cities Services, Inc. but have not been published.

4.3.1 Hanford Site Drinking Water Systems

Drinking water was supplied to DOE facilities on the site by 11 DOE-owned, contractor-operated, water treatment and distribution systems (Table 4.3.1), and one system owned and operated by the city of Richland. Nine of these systems (including Richland's system) used water pumped from the Columbia River. Two systems used groundwater from beneath the site. In 2000, most

of the systems were operated by DynCorp Tri-Cities Services, Inc.; however, Fluor Hanford, Inc. operated two systems in the 400 and 100-K Areas, and Bechtel Hanford, Inc. operated one system in the 100-N Area that was supplied with water from a pumping station operated by DynCorp Tri-Cities Services, Inc. The city of Richland provided drinking water to the 300, 700, and Richland North Areas.

4.3.2 Hanford Site Drinking Water Supply Facilities

In 2000, radionuclide concentrations in onsite drinking water were monitored at the four DOE-owned water supply facilities shown in Figure 4.3.1. The 100-B Area pumphouse continued to serve as the primary Columbia River pumping station for many areas on the site (100-N Area, 200-East and

200-West Areas, 251 Building, and 100 Areas Fire Station), with the 100-D Area pumphouse available as an emergency backup. Water for the 100-K Area was supplied by the 181-KE pumphouse. Water for the 200-East Area, which formerly came from the 283-E water treatment plant located in the 200-East



Table 4.3.1. DOE-Owned Drinking Water Systems on the Hanford Site, 2000

<u>Location</u>	<u>Source of Supply</u>	<u>Notes</u>
100-D	Columbia River via 181-B or D raw water export	Permanently removed from service on July 12, 2000. Filtered and chlorinated at 183-D Headhouse. Operated by DynCorp Tri-Cities Services, Inc.
100-B	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 182-B Reservoir Pumphouse. Operated by DynCorp Tri-Cities Services, Inc.
100-K	Columbia River via 181-K Pumphouse	Filtered and chlorinated at 185-KE Water Treatment Plant. Operated by Fluor Hanford.
100-N	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 186-N Water Treatment Plant. This is a small skid-mounted package plant that contains three banks of various sized filters and a sodium hypochlorite system for disinfection. Operated by Bechtel Hanford, Inc.
200-E	Normally from the Columbia River via the 283-W Water Treatment Plant. In emergencies, supplied via 181-B or D raw water export and 283-E Water Treatment Plant.	Filtered and chlorinated at 283-W Water Treatment Plant. The clearwells at 283-E serve as reservoirs that supply the 200-East Area distribution system. Under normal conditions, the clearwells are supplied from the 283-W Water Treatment Plant. The 283-E Water Treatment Plant is maintained in standby mode for emergencies. Operated by DynCorp Tri-Cities Services, Inc.
200-W	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 283-W Water Treatment Plant. Operated by DynCorp Tri-Cities Services, Inc.
251 Building (electrical switching)	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 251 Building. Operated by DynCorp Tri-Cities Services, Inc.
Yakima Barricade	Well 699-49-100C	No treatment provided. Non-potable. Operated by DynCorp Tri-Cities Services, Inc.
609 Building (100 Areas Fire Station)	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 609 Building. Operated by DynCorp Tri-Cities Services, Inc.
400 Area	Wells 499-S1-8J, 499-S0-8, and 499-S0-7	Supplied from well 499-S1-8J (P-16); well 499-S0-8 (P-14) is the emergency supply, well 499-S0-7 (P-15) is the dire emergency supply. Wells P-14 and P-15 were not used in 2000. Chlorination only. Operated by Fluor Hanford.
300 Area	Treated Columbia River water via city of Richland	300 Area distribution system. Operated by DynCorp Tri-Cities Services, Inc.

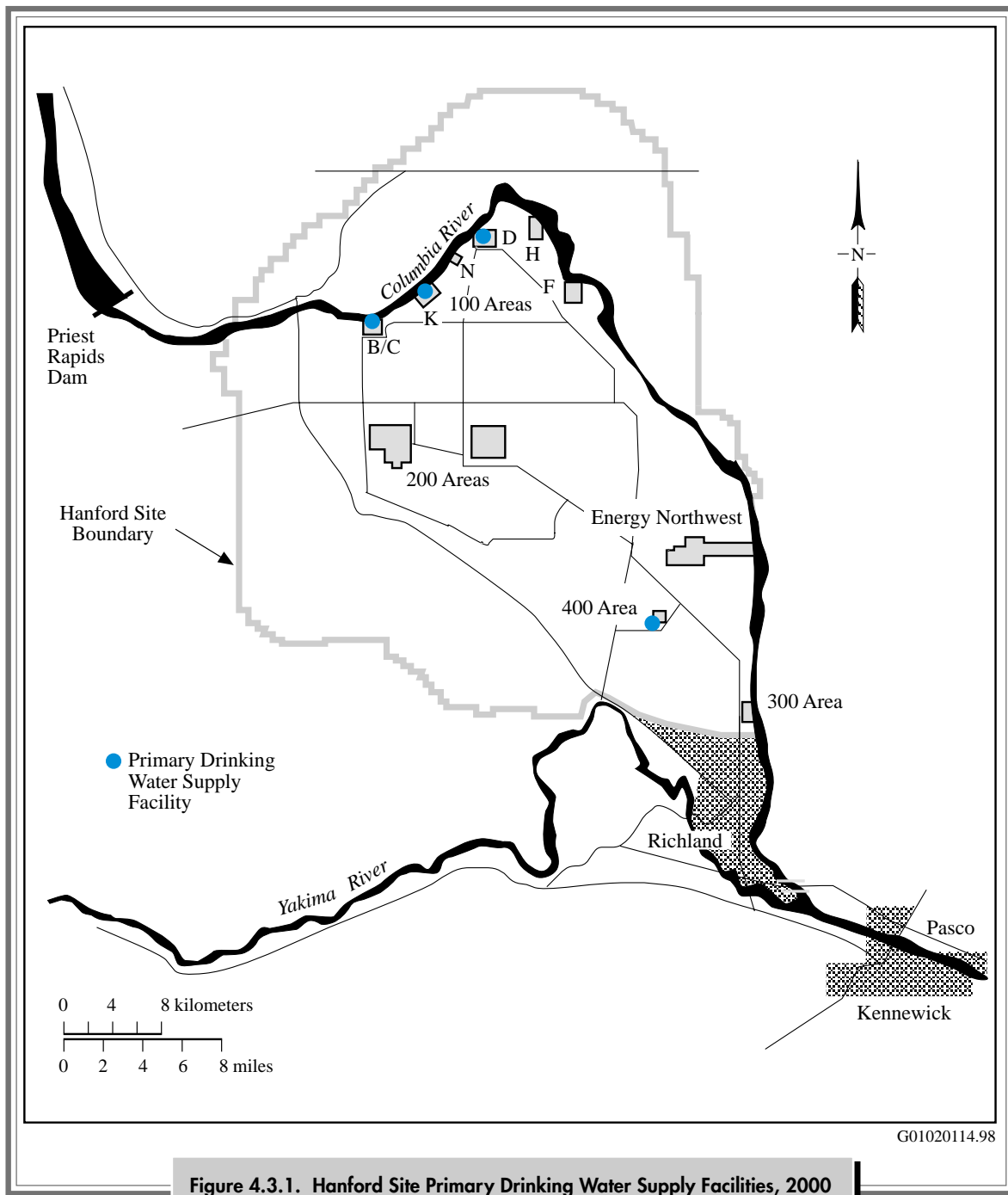


Figure 4.3.1. Hanford Site Primary Drinking Water Supply Facilities, 2000





Area, was supplied by the 283-W water treatment plant (located in the 200-West Area). The 283-E treatment plant was designated as an emergency supply facility in 1999 and was maintained in a standby mode in 2000. The water system at the Yakima Barricade was declared non-potable in 1999 and the well was removed from service on February 13, 2000.

The 400 Area continued to use well 499-S1-8J (P-16) as the primary drinking water supply well, with well 499-S0-8 (P-14) serving as the emergency

supply. Well 499-S1-8J is 122 meters (401 feet) deep and was installed in April 1985. Well 499-S0-8 is 90 meters (294 feet) deep and was installed in March 1972. Well 499-S0-7 (P-15), 122 meters (399 feet) deep, was installed in March 1972 and continued to function as the dire emergency supply. Neither well 499-S0-8 nor 499-S0-7 were used as drinking water sources in 2000. In addition to supplying drinking water, these three wells were also important for maintaining fire suppression capabilities within the 400 Area where they are located.

4.3.3 Collection of Drinking Water Samples and Analytes of Interest

Drinking water samples for radiological analyses were collected according to a schedule established at the beginning of the calendar year (PNNL-13109). Samples at all of the locations were collected and analyzed quarterly. Samples from three locations were grab samples of untreated water. The 400 Area samples were grab samples of treated water. The Hanford Groundwater Monitoring Project also collected samples of raw well water from the 400 Area drinking water wells. These samples were analyzed monthly. Drinking water samples obtained from the 400 Area in May were cosampled with the Washington State Department of Health. The analytical results from the state's samples help to verify the quality of the drinking water data reported herein and in PNNL-13487, APP. 1.

In the 300 Area, water from the city of Richland's system was not monitored for radiological contaminants through the site drinking water

surveillance project; however, personnel from Pacific Northwest National Laboratory's Surface Environmental Surveillance Project routinely collected water samples from the Columbia River at the Richland Pump House, which is the city of Richland's drinking water intake. The analytical results (radiological) for these raw river water samples can be found in Appendix B (Table B.2). Sampling of 300 Area drinking water for non-radiological analyses was routinely conducted by DynCorp Tri-Cities Services, Inc. to monitor the DOE-owned, contractor operated water distribution system within the area. However, as stated earlier, non-radiological data are reported directly to the state and are not discussed in this report.

All 2000 drinking water samples collected for radiological analysis were analyzed for gross alpha, gross beta, tritium, and strontium-90.

4.3.4 Radiological Results for Hanford Site Drinking Water

Results for radiological monitoring of Hanford Site drinking water during 2000 are summarized in Table 4.3.2. Individual analytical results are reported

in PNNL-13487, APP. 1. The maximum amount of beta-gamma radiation from manmade radionuclides allowed in drinking water by Washington State and

Table 4.3.2. Selected Radiological Constituents in Hanford Site Drinking Water, 2000 Annual Average Concentrations (pCi/L)^(a)

<u>System</u>	<u>No. of Samples^(b)</u>	<u>Gross Alpha</u>	<u>Gross Beta</u>	<u>Tritium</u>	<u>Strontium-90</u>
100-B Area	4	0.82 ± 0.16	0.87 ± 0.22	124 ± 24	0.07 ± 0.01
100-D Area	4	0.52 ± 0.16	0.91 ± 0.22	59 ± 17	0.07 ± 0.01
100-K Area	4	0.35 ± 0.28	2.12 ± 1.34	47 ± 3	0.07 ± 0.00
400 Area (FFTF) ^(c)	4	0.19 ± 0.12	6.11 ± 0.12	3,852 ± 106	0.006 ± 0.01
Standards		15 ^(f,g)	50 ^(g,h)	20,000 ^(g,i)	8 ^(f,g)

- (a) Average value ±2 standard error of the calculated mean.
(b) Grab samples collected and analyzed quarterly.
(c) Untreated raw water.
(d) No sample collected in first quarter of calendar year.
(e) FFTF = Fast Flux Test Facility; samples collected at the tap.
(f) WAC 246-290.
(g) 40 CFR 141.
(h) Equivalent to 4 mrem/yr standard.
(i) Concentration assumed to yield an annual dose of 4 mrem/yr.

EPA is an annual average concentration that will not produce an annual dose equivalent to the whole body or any internal organ greater than 4 mrem/yr. If both tritium and strontium-90 are present, the sum of their annual dose equivalent to bone marrow must not exceed 4 mrem. Compliance with this standard may be assumed if the annual average concentrations for gross alpha, gross beta, tritium, and strontium-90 are less than 50, 15, 20,000, and 8 pCi/L, respectively (40 CFR 141 and WAC 246-290). All DOE-owned drinking water systems on the Hanford Site were in compliance with Washington State and EPA annual average radiological drinking water standards in 2000, and results were similar to those observed in recent years (see Section 4.3 in PNNL-12088 and PNNL-13230).

The Hanford Groundwater Monitoring Project collected and analyzed raw water samples monthly from all three 400 Area drinking water wells. Results from these samples show that tritium levels continued to be lowest in well 499-S1-8J and consistently highest in well 499-S0-7 (Table 4.3.3; Figure 4.3.2). A tritium plume that originates in the 200-East Area extends under the 400 Area and has historically affected tritium concentrations in wells 499-S0-7 and 499-S0-8 (see Figure 4.3.2). During 2000, annual average tritium concentrations in both of these wells were below the 20,000 pCi/L state and federal annual average drinking water standard.



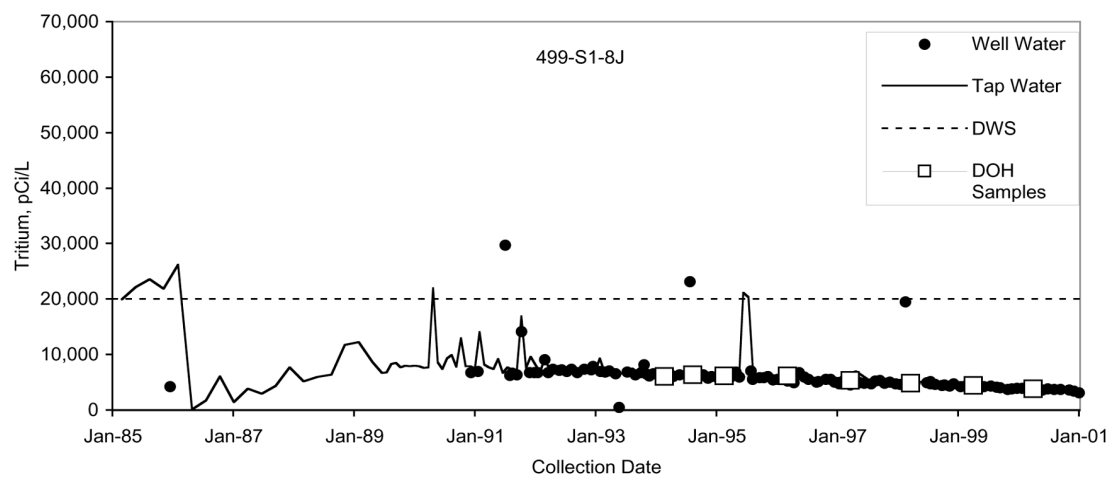


Table 4.3.3. Tritium Concentrations (pCi/L) in 400 Area Drinking Water Wells, 2000^(a)

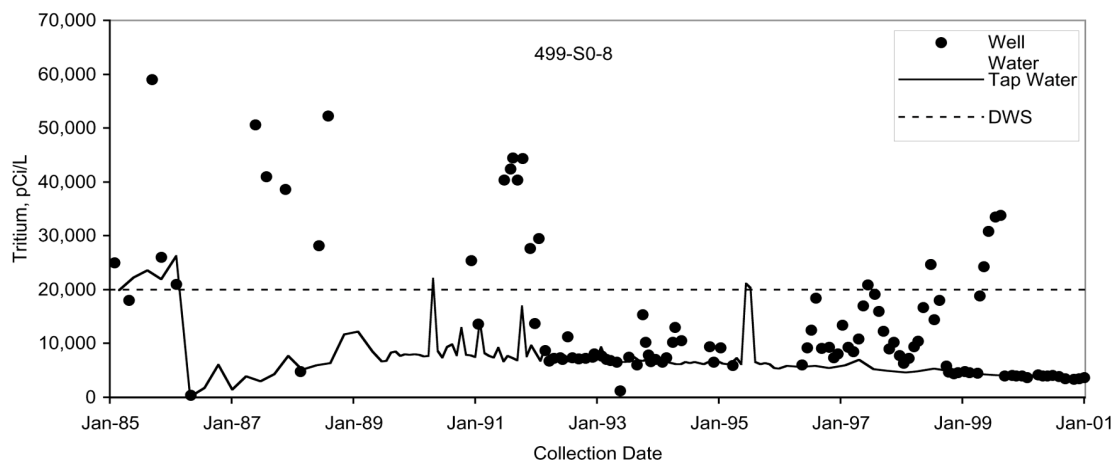
<u>Sampling Date</u>	<u>Primary Drinking Water Well 499-S1-8J (P-16)</u>	<u>Emergency Drinking Water Well 499-S0-8 (P-14)</u>	<u>Dire Emergency Drinking Water Well 499-S0-7 (P-15)</u>
January 21, 2000	3,960 ± 420	3,670 ± 410	15,200 ± 950
February 23, 2000	3,800 ± 420	ND ^(b)	16,000 ± 1,000
March 29, 2000	3,850 ± 470	4,170 ± 470	15,200 ± 1,000
April 25, 2000	3,910 ± 430	4,010 ± 440	16,400 ± 1,000
May 22, 2000	3,610 ± 430	4,030 ± 460	15,600 ± 1,000
June 22, 2000	3,880 ± 440	4,090 ± 450	8,250 ± 660
July 31, 2000	3,700 ± 430	3,870 ± 450	14,800 ± 970
September 7, 2000	3,720 ± 420	3,460 ± 410	14,400 ± 930
October 30, 2000	3,620 ± 450	3,420 ± 440	14,800 ± 990
November 28, 2000	3,440 ± 440	3,530 ± 440	15,100 ± 1,000
December 29, 2000	3,120 ± 410	3,710 ± 440	12,500 ± 880

(a) Reported concentration ±2 total propagated analytical error.

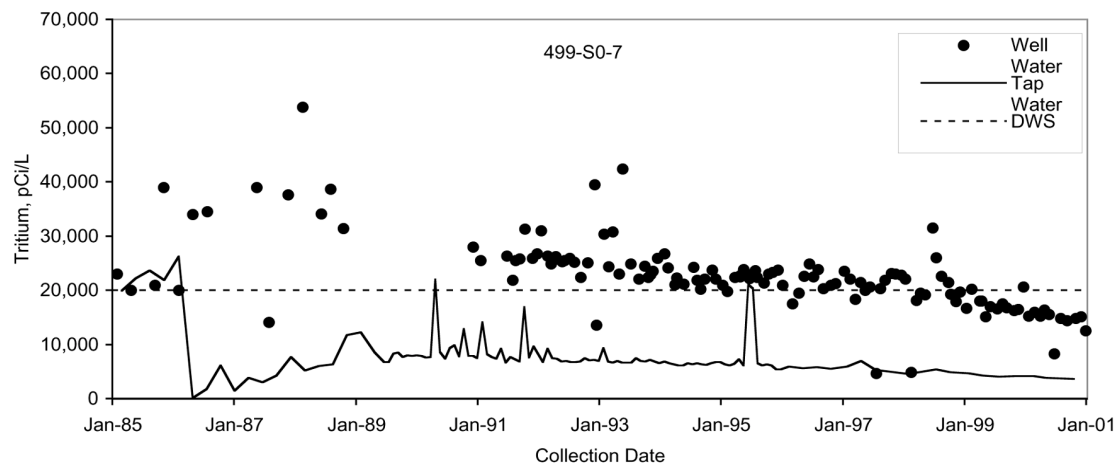
(b) ND = No data.



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Figure 4.3.2. Tritium Concentrations in Drinking Water from Three Wells in the 400 Area, 1984 through 2000 (DOH = Washington State Department of Health, DWS = drinking water standard)

